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Patentanmeldung Nr. Patent application No. Demande de brevet n°

98203229.4

PRIORITY DOCUMENT

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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Application no.: 98203229.4
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Remarques: Philips Electronics N.V.

Communication system with improved access network.

The present invention relates to a communication system comprising a plurality of terminals which are connected to a network switch via an access network, the access network comprising an access node coupled to the terminals via a transmission network, the access node further being coupled to the network switch.

The present invention also related to an access node for use in such a communication system.

A communication system according to the preamble is known from "Delivery System Architecture and Interface, DAVIC 1.3 specification, part 4, revision 6.2, Geneva 1997.

Such communication systems are proposed for providing wide band and narrow band services to a plurality of subscribers. Examples of these services are video broadcast, video on demand, telephony and fast Internet access.

In order to provide switched services, such as video on demand and telephony, the terminals are connected to the switching means via an access network. The access network comprises an access node coupled to a transmission network. The transmission network can e.g. be a bi-directional Hybrid Fiber Coax network.

A problem with the communication network according to the prior art is that the network switch needs to known all details of the access network in order to be able to deliver information to the correct terminal. Such a network switch is substantially more complex that a standard network switch, which is able to interface to the access network using a standard signaling protocol. It is observed that the access node switch is in general substantially less complex than the network switch. Consequently, the replacement of a dedicated network switch by a combination of a standard network switch and an access node switch still results in a substantial overall reduction of the complexity of the communication system.

session layer and/or transport layer information exchanged between a terminal and the network switch.

By using proxy signaling means in the network switching means for deriving network layer control information from session and/or transport layer information, it is obtained that the terminals can be simplified at the cost of a small complexity increase of the network switching means. Due to the large number of terminals, this measure results in a decreased cost of the communication system.

The present invention will now be explained with reference to the drawing figures.

Fig. 1 shows a communication network according to the invention.

Fig. 2 shows the downstream elements in a communication network according to the invention.

Fig. 3 shows a diagram explaining the address translations to which an ATM cell is subjected when it is transmitted from the core network 2 to the terminal 46.

Fig. 4 shows the upstream elements in a communication network according to the invention.

Fig. 5 shows a diagram explaining the address translations to which an ATM cell is subjected when it is transmitted from the terminal 46 to the core network 2.

Fig. 6 shows the set-up of a connection in a communication system according to the invention.

Fig. 7 shows the signal flow in a network according to the invention.

The communication network according to Fig. 1 comprises an access network 1 which is connected to a core network 2 via the network switch 4. The access network comprises a plurality of service areas 21, 23 and 25. The network switch 4 is coupled to said service areas 21, 23 and 25 via the network control switch which is here a cross-connect 8. Each of the service areas 21, 23 and 25 comprises a corresponding Network Control Node 3, 12 and 5 respectively. The network control nodes 3, 12 and 5 are coupled to the respective sub-networks 7, 9 and 19, which can comprise a Hybrid Fiber Coax network (HFC), which type of network is presently extensively used for CATV transmission.

The switch 4 is further connected to a cross-connect 8, which is arranged for directing the ATM cells into the proper parts in the access network. In order to enable the cross connect to direct the ATM cells to the proper parts of the network, at an interface P10 the address of the ATM cell is translated by a translator 6. The address carried by ATM cells at the input of the translator 6 is translated into an address comprising a VPI identifier identifying the service area to which the cell should be routed and which carrier should be used in said service area. This translation is performed by reading a table, which is addressed with the original VPI/VCI identifier of the ATM packet.

In general, the table in translator 6 is updated each time a connection is set up or is disconnected. During the set up of a call a table entry with input value the VPI/VCI identifier of the terminal to be called is added. The corresponding output value comprises information about the service area and the carrier to be used in the VPI field, and an identification of the terminal to be addressed in the VCI field.

The cross connect 8 reads the VPI field of the incoming ATM packets, and routes it to an output determined by the part of the VPI value indicating the service area. In the system according to Fig. 2, outputs of the cross connect 8 are connected to the network control elements of which network control element 12 and the corresponding part of the system are shown. In the network control element 12, the input is connected to the network control switch 100. The network control switch 100 routes the signals received from the cross connect 8, via a translation unit 101, 102 or 103 to one of the channel cluster modules 25, 27 or 19. The channel module to be chosen is indicated by the part of the VPI field in the received packets indicating the channel cluster module to be used. The address translation units 101, 102 and 103 replace the combination of VPI/VCI by a new combination of VPI/VCI that is determined from the original VCI value only. This translation enables a more flexible addressing, because a larger address space is available.

In the new combination of VPI/VCI, the VPI field is used to address the network terminator to which the destination terminal is connected. The VCI field identifies the destination terminal.

In the channel cluster module 25, the ATM packet with the translated address information, is passed via a multiplexer 14 to a modulator 16 having a predetermined carrier frequency. The selection of the service area and the modulator (is selection of carrier frequency) therein is done on basis of the output VPI value at interface P10. The multiplexer 14 is present to enable the Network Control Node 12 to transmit control information to the corresponding Network Termination. The output signal of the selected modulator (e.g. 22) is

The VPI_C part of the address information 35 is used to route the ATM packet to the proper service area and modulator. The VCI' part of the address information is used as input for the translation of the address information at interface P7. The VCI' part is used to address a table 37 from which the translated address information VPI_{NT}/VCI" is read. The table 37 is held in the translation means 10 in Fig. 2. The part VPI_{NT} indicates the address of the NT to which the destination terminal is connected, and the part VCI" indicates the address of the destination terminal.

The combination 39 of the address information VPI_{NT}/VCI" is used as input for the address translation at interface P2. Said combination of VPI_{NT}/ VCI" is used to address a table 41 which is held in the translator 44 in Fig. 2. At the output of the table the VPI/VCI combination according to the addressing scheme of the core network is available for addressing the terminal.

Fig. 4 shows the elements involved with the upstream transmission for a communication network according to Fig. 1. An ATM packet originated at a terminal 46 or 48 is applied to an address translator 76. The address translator 76 in the network termination 32 translates the original address information VPI/VCI into translated address information VPI_{NT}/VCI_{PRIOR}.

The part VPI indicates the Network Termination 32 via which the packet is transmitted. According to an aspect of the present invention, the part VCI_{PRIOR} indicates the Quality of Service with which the ATM packet has to be transmitted. A selector 74 selects the ATM packets received from the translator 76 and passes them to one of the buffers 68, 70 or 72 according to their VCI_{PRIOR} indicator. The buffer 68 can be assigned to a Constant Bitrate QoS (CBR) with a high bitrate, the buffer 70 can be assigned to a Constant Bitrate QoS (CBR)with a medium bitrate, and the buffer 72 can be assigned to a Variable Bitrate (VBR) QoS.

A CBR QoS with high bitrate is e.g. suitable for transmission of video signals, a CBR QoS with medium bitrate is e.g. suitable for transmission of audio signals, and a VBR QoS is suitable for the transmission of data which occurs e.g. with file transfer. The ATM packets at the output of the buffers 68, 70 and 72 are multiplexed with a multiplexer 64 into an output stream. The multiplexer takes the different QoS properties of the output signals of the buffers 68, 70 and 72 into account, by transmitting the packets according to a priority which is dependent on the buffer from which the packet is read. It is clear that the buffers carrying CBR signals have a higher priority than the buffers carrying VBR signals. Amongst the buffers

according to the proper Quality of Service indicated by the address part VCI'. The VCI' part of the address information is used as input for the translation of the address information.

At interface P7, the VCI' part of the address information 47 is used to address a table 49 from which the translated address information VPI_{OUT}/VCI' is read. The table 49 is held in the translation means 10 in Fig. 4. The part VPI_{OUT} indicates the output of the cross connect 8 to which the packet should be transferred.

The combination 51 of the address information VPI_{OUT}/VCI' is used as input for the address translation at interface P10. Said combination of VPI_{OUT}/ VCI' is used to address a table 53 which is held in the translator 6 in Fig. 4. At the output of the table 53 the VPI/VCI combination according to the addressing scheme of the core network is available for submitting the packet to the switch 4.

It is observed that the address translation at the interfaces P10, P8 and P2 are very similar for upstream and downstream. This enables that the translation units 6, 10 and 76 can be used for downstream and upstream traffic and in that the method comprises translating the address information before the packets enter the crossconnect 8.

In the diagram according to Fig. 6, it is assumed that a request for a connection is initiated by a terminal. Due to the transparent connection between the terminal and the network switch the terminal sends a set-up message 120 to the network switch 4. In response to said set-up message 120, the network switch issues a set-up message 122 to the public network it is connected to, and a set-up message 123 to the access node. The access node reserves resources for handling the requested call, and subsequently submits a set-up message 124 to the NT.

The NT replies to the set-up message 124 by transmitting a connect message 125 to the access node to indicate that the connection has been established. The access node submits in response to the connect message 125 received from the NT, a connect message 126 to the network switch 4, for indicating the connection establishment.

When the network switch 4 has received the connect message 126 from the NT and the connect message 127 from the public network, a connect message 128 is sent to the terminal indicating that the connection has been established.

If the connection requested by the terminal is a connection with a local terminal, the network switch 4 sends two set-up command to the access node for setting up a connection between the network switch and the NT's to which the calling and the called

CLAIMS:

1. Communication system comprising a plurality of terminals which are connected to a network switch via an access network, the access network comprising an access node coupled to the terminals via a transmission network, the access node further being coupled to the network switch, characterized in that the access node comprises an access node switch and a plurality of network control elements, in that the access node switch is coupled to the network switch and to the plurality of network control elements, in that the transmission network comprises a plurality of sub-networks, and in that the network control elements are coupled to the plurality of sub-networks.

2. Communication system according to claim 1, characterized in that the network control elements comprise a network control switch and a plurality of channel cluster modules, in that the network control switch is coupled to the access node switch and to the channel cluster modules, and in that the channel cluster modules are coupled to the sub-network corresponding to the network control node.

3. Communication system according to claim 2, characterized in that the channel cluster modules comprise at least one downstream channel module.

4. Communication system according to claim 3, characterized in that the channel cluster module comprises an upstream channel module.

5. Communication system according to one of the claims 1, 2, 3 or 4, characterized in that the terminals comprises signaling means for exchanging network layer control information with the network switch.

6. Communication system according to one of the claims 1, 2, 3 or 4, characterized in that the network switch comprises proxy signaling means for deriving network layer control information from session layer and/or transport layer information exchanged between a terminal and the network switch.

ABSTRACT:

In a communication system a network switch (4) is coupled to an access network (1) in order to be able communication between a network (2) and terminals (13) connected to the access network (1). In the prior art communication system, the network switch needs to know the details of the access network, in order to be able to deliver information to the correct terminal.

This requires that a dedicated network switch (4) is used which is substantially more complex than a standard network switch.

To solve this problem, an access node switch (8) is used which deals with the access network specific details. Consequently a network switch (4) can be used which operates according to standard switching protocols can be used.

Fig. 1

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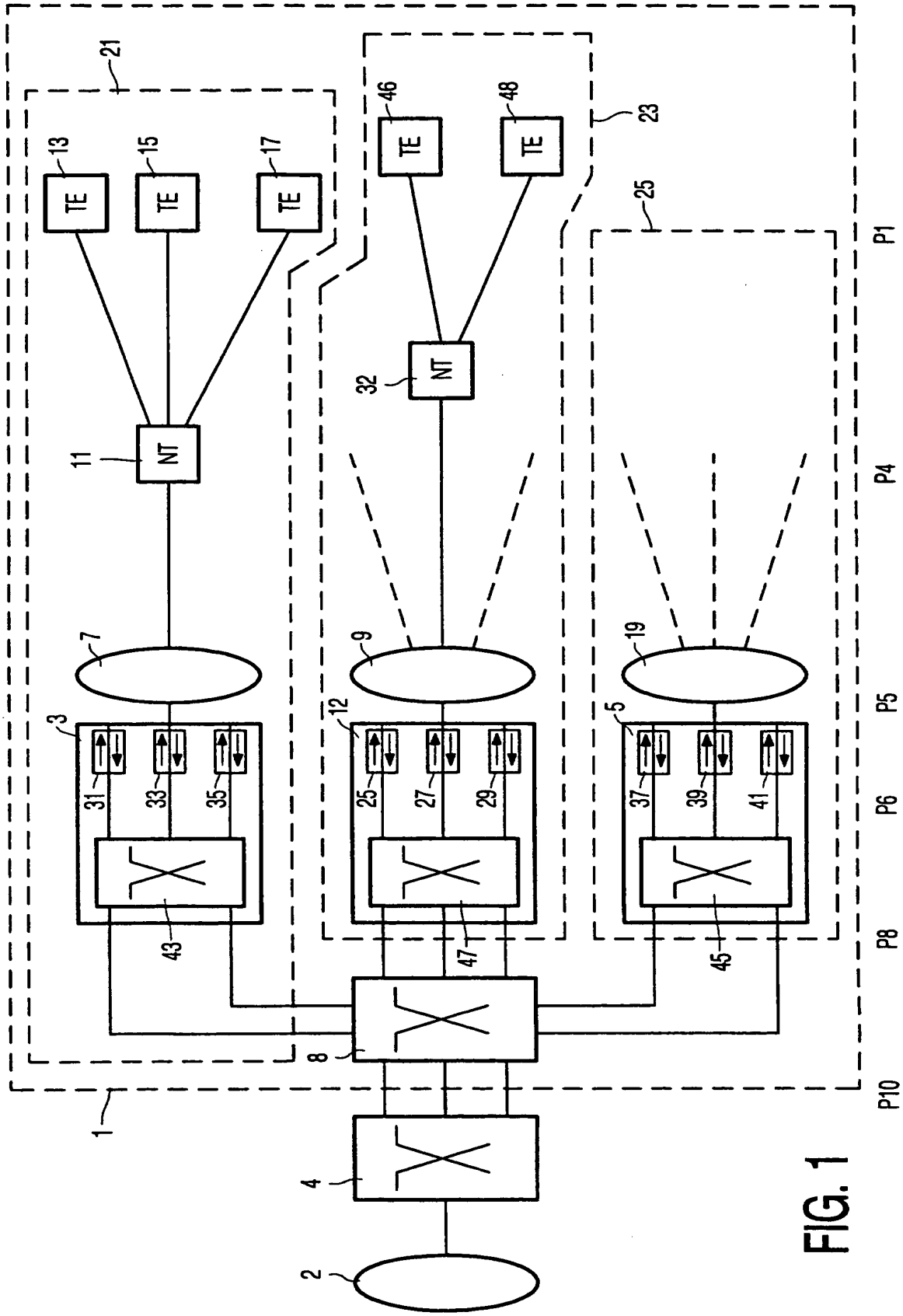
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25
P1
P4
P5
P6
P8
P10
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13
15
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46
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NT
11
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9
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3
12
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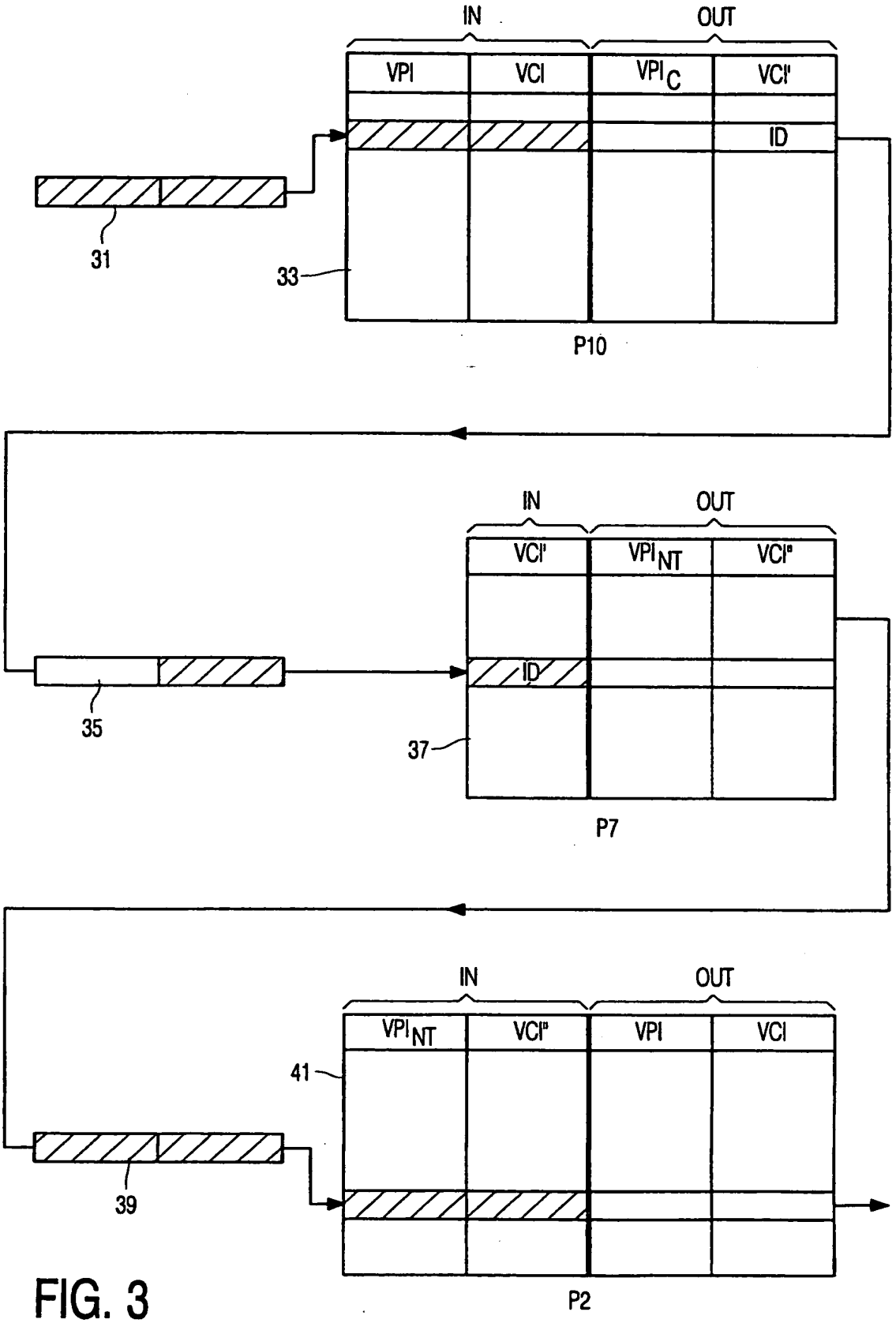
1
4
2

FIG. 1

3/6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VCI
VPI C
VCI'
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VCI'
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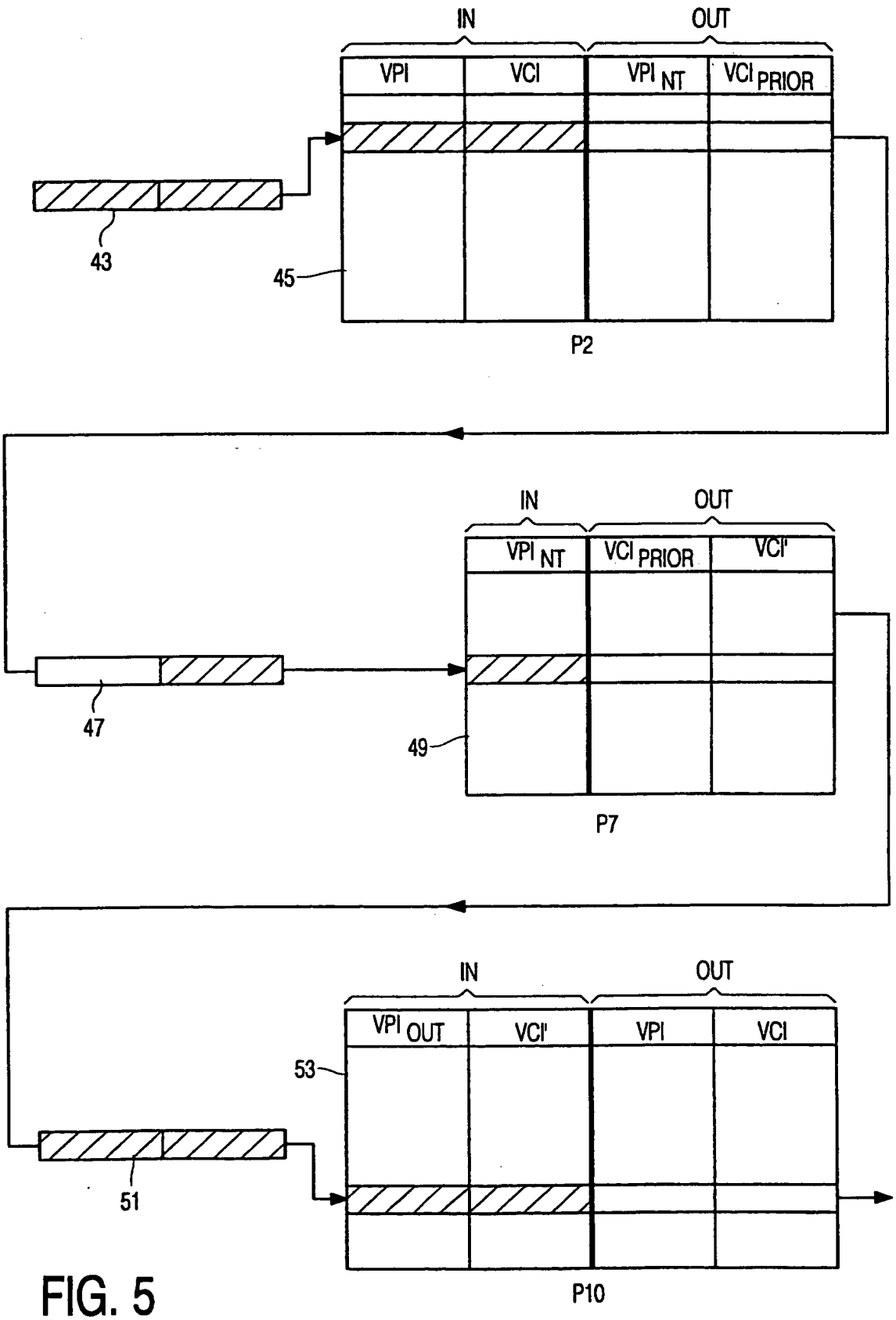
VCI
41
39
P2

FIG. 3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OUT
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VCI'
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P7
IN
OUT
VPI OUT
VCI'
VPI
VCI
53
51
P10

FIG. 5